PERCEPTIONS OF TECHNOLOGY AND TECHNOLOGY EDUCATION IN SIXTH GRADE STUDENTS

By

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ABSTRACT

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Because female enrollment in Technology Education dropped off so markedly after the initial required sixth-grade class at Kennedy Middle School, the researcher sought to measure the differences in how boys and girls in that age group perceive the course and technology in general. The review of literature showed that gender issues have been a major part of educational research in the 1990s. Despite the fact that the research has had inconsistent results regarding boys' and girls' class room performance and does not definitively show which sex is at a greater disadvantage, Technology Education is the one subject area that has shown a definite pattern of greater male interest and success.

The students' perceptions were measured using an instrument that was developed for a previous study. The 29 question instrument used a four-point scale to measure students' perceptions of the word technology, overall interest level and perception of the course content. The results were analyzed by the author and presented in bar graph form based on the mean score of each question along with a discussion. Recommendations

were made to increase female interest and overall student interest in the sixth grade Technology Education classes offered at Kennedy Middle School and for the discipline of Technology Education in general.

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CHAPTER ONE

Introduction

Kennedy Middle School (KMS) in Germantown, Wisconsin presently enrolls approximately 850 students in grades 6, 7, and 8. Germantown was once a small farming community that is located about 25 miles northwest of Milwaukee. Tremendous growth in the past 20 years, as the greater metropolitan area has expanded, has transitioned it into a burgeoning suburb that is among the fastest growing in the state. As is typical of Milwaukee suburbs, the student population is largely Caucasian, but there is some minority representation from both the community and the transfer program. There are also several students of foreign birth or with foreign-born parents.

Kennedy offers a curriculum of basic academics, including traditional classes such as math, social studies, language, etc.; combined with another set of departments referred to as the "Coordinated Arts". The Coordinated Arts Department includes Music, Art, Spanish, Physical Education, Computer Applications, and Technology Education. Whereas the academic teachers are limited to single grade level, the Coordinated Arts teachers, for the most part, work with all three.

The Technology Education department presently consists of two teachers. Both teachers are graduates of the University of Wisconsin-Stout and both are in their second year of middle school teaching. One has never taught prior to acquiring this position, with the exception of extensive substitute teaching in other districts. The other has had nearly 30 years experience in high school teaching and administration in other districts.

Technology Education is required in the sixth grade, and then offered as electives for seventh and eighth grade. These electives, entitled Communication, Construction, Manufacturing and Transportation are offered as A and B level classes. The A level courses can be taken in the seventh and eighth grade, while the B level can only be taken by eighth graders. Though it might appear as if the A classes were a prerequisite for the B classes, this is not really the case, though projects in the B classes tend to be more

difficult. The sixth grade course has a relatively even distribution of gender, but the seventh grade girls make up no more than twenty percent of the program population. By eighth grade the percentage is even lower.

Low percentages of female students in Technology Education are certainly nothing new. In fact, until the late 1960s and early 1970s most public schools did not allow female students to take Technology Education (the discipline went by the title Industrial Arts at that time). As equity in education developed and girls were enrolled in Technology Education, percentages naturally increased. Generally, this occurred only when the course was required. Females voluntarily taking "shop" classes remained relatively few and far between (Silverman and Pritchard, 1996). This phenomenon has been the subject of several studies including "Student Perspectives on Technology and Technology Education" by Paniagua (1999). Paniagua sought to discover how the attitudes of females and males differed toward technology and Technology Education using a survey instrument that measured students "technological perspectives" toward the school program and toward the world in general. The study was done with students in the Milwaukee Public School system, a majority of them being of African-American ethnicity (Paniagua, 1999).

Paniagua's work seemed well matched to the situation in Germantown. Though her work was done with students of an inner-city population in the seventh grade, it did not seem an enormous stretch to use the same instrument with a largely white suburban population in the sixth grade. The survey instrument used in Paniagua's study was developed at the University of Wisconsin-Stout and drew on the expertise of several professors. It was pilot tested for reliability and used successfully to gather information for a thesis.

Why is it important to interest young females in technology education? The world has grown increasingly technological in virtually all areas of human endeavor and therefore most of the jobs with growth potential are in that sector. Computers have been

incorporated into virtually every business, government, and educational venture of the modern industrial world. Technology has also profoundly changed American home life and will no doubt continue to do so. We are, in short, a culture entirely dependent on technology yet we have significantly disenfranchised one-half of our population. Women are also still at a compensatory disadvantage despite the fact a greater percentage of them seek higher education. It should be emphasized at this time that the term "technology" does not simply mean computers but rather extends to manufacturing, transportation, communication, and construction systems.

Though the Technology Education Department of Kennedy Middle School does not presently seek to comprehensively overhaul the existing curriculum, it is clearly apparent that some changes have to be made to attract more female students and gain a better understanding of what all students want from the classes. Paniagua (1999) stated:

> The results of this study will allow teachers to identify if their current teaching practices are in alignment with student perceptions of and interests in technology. The study may also provide a basis from which Technology Education Teachers may extend the research either to study a specific area of technology in their school.

Statement of the Problem

The Technology Education Department of Kennedy Middle School consistently experiences a significant drop off in female enrollment after sixth grade when all students are required to take a one-quarter introductory class. By surveying student perspectives it may be possible to identify reasons for why this occurs and make appropriate curriculum adjustments to increase the interest level for female students.

Purpose of the Study

The purpose of this descriptive study is to identify the extent to which perspectives on technology differ between boys and girls in a sixth grade classroom.

Research Questions

The questions this study will answer are as follows:

1. How do boys and girls differ in their perception of technology?
2. To what extent are boys and girls interested in learning about technology to prepare for academic or career choices?
3. To what extent are boys and girls interested in learning about societal impacts of technology?
4. To what extent are boys and girls interested in learning about technology as it pertains to their lives?
5. To what extent are boys and girls interested in learning how technology can be used?
6. To what extent are boys and girls interested in how technology works?
7. To what extent are boys and girls interested in technology as people connectors?
8. To what extent do current technology education classes support students' interests in technology?
9. How do boys and girls differ in their interests and willingness to enroll in Technology Education classes at their school?

Limitations of the Study

The limitations of this study are as follows:

1. The content researched was limited to sixth grade students.
2. The results of this study are generalizable only to sixth grade students at Kennedy Middle School.
3. Though the study uses an instrument developed by a previous study, it does not in anyway attempt to replicate or compare the findings to that study.

Definition of Terms

Curriculum: The composite array of learning experience provided by an institution or department (Mitzel, 1982).

Technology: The use of our knowledge, tools, and skills to solve practical problems, and to extend human capabilities (Goetsch and Nelson, 1987)

Technology Education: A course of study with a content that focuses on the knowledge, tools, processes, and systems of technology in society.

Technology as Objects: Objects deal with the physical, tangible things and are result or end product of technological innovation, knowledge and/or process.

Technology as Process: Process deals with the operational level of technology. The doing, the using, the making, the fixing, etc. that demonstrates a methodical procedure to identify technology as a process.

Technology as Knowledge: Knowledge refers to the know-how associated with technological activity. It deals with the knowing and the ability to put knowledge into action.

Technology as Futuristic: Futuristic refers to all the innovative, forward-looking aspects of technology, or the creative inventiveness of human thought.

CHAPTER TWO

Review of Literature

Introduction

Few would disagree that adolescence is the time of greatest change in a human life. How teenagers perceive themselves and the world around them changes enormously from how they had done so as a child. Things that formerly were not the least bit important, or possibly not even thought about, may suddenly become the center of their attention. Old interests may drop off like they never existed. And, all this while a shift occurs in their schooling routine, when elementary becomes middle school, which further complicates their lives. Therefore, before examining studies on gender and teenage perceptions of technology, it may help to understand where they are mentally in the middle school years.

Every teenager experiences these changes of perception differently on a subjective level, and evidence shows boys probably experience them somewhat differently than girls. Still, it has been established by the American Academy of Pediatrics (1991) that there are generally three distinct phases of adolescent psychological development. In the beginning, a teen's cognitive abilities expand and their thinking shows qualities that are more adult-like. They begin to compare and contrast their learned values and beliefs with those they are exposed to from others sources such as friends and the media. They also begin to rebel against authority. In the second phase of adolescence, teenagers tend to ignore rather than defy adults. Peers heavily influence their thoughts and actions. Experimentation with drugs and sexuality may begin during this phase. As the teenager reaches late adolescence, they actually begin to stabilize, and start to settle on their own values. For the most part, it is the first two phases that occur in a middle school. A student with qualities of the third phase may appear on rare occasion, but for the most part the worldview and learning style at middle school age are highly egocentric.

Gender Equity

Though a comprehensive overview of women's rights and the pursuit of equality are far beyond the scope of this paper, it is relevant to take a look at women's (and girls') equity issues as they have affected the classroom. The decline of academic success by females at adolescence has been in the news since 1991 when the American Association of University Women (AAUW) released *Shortchanging Girls, Shortchanging America.* After examining 1300 studies from the 1970s and 1980s and commissioning some others, the AAUW found that adolescent girls are at a disadvantage in the educational system. The report was condensed the following year into a book called *How Schools Shortchange Girls* (AAUW, 1992). The primary issue of *How Schools Shortchange Girls* is the significant drop in girls' self-esteem between the ages of 10 and 16 and how this profoundly affects their school performance (Gilligan, 1990). This is backed up by citations of other studies that show girls also tend to lose confidence in their ability to do math (Reyes, 1984, as cited in AAUW, 1992), gain an increasingly negative view of science (Zimmer & Bennet, 1987, as cited in AAUW, 1992), and have fewer experiences with mechanical or electrical apparatus (Kahle & Lakes, 1983, as cited in AAUW, 1992). This is despite the fact that many girls had experienced success in these subjects while in elementary school (Dossey, 1990, as cited in AAUW, 1992). *How Schools Shortchange Girls* reports that boys, in general, are also happier with themselves in middle school and high school (AAUW, 1990), and whereas boys will tend to attribute lack of success to not trying hard enough, girls will tend to attribute it to lack of ability (Leder, 1990, as cited in AAUW, 1992). Furthermore, it says girls in sixth and seventh grade rate popularity as more important than competence, and boys are just the opposite (Simmons & Blythe, 1987, as cited in AAUW, 1992). For the cause of all this, the AAUW report puts most of the blame on the schools and society at large. One of the main reasons they cite is teacher favoritism, in that they tend to call on certain males more often because they are louder

and more aggressive and demand more attention (Sadker & Sadker, 1985, as cited in AAUW, 1992), and possibly because the teachers may believe certain males are more skilled than the rest of the class (Eccles, 1989, as cited in AAUW, 1992). Also cited are: A classroom climate that isn't welcoming and comfortable to females (Belenky et al., 1986, as cited in AAUW, 1992); Student attitudes that are negative to the input of females (Lockheed & Harris, 1984, as cited in AAUW, 1992); Curriculum and textbooks that are biased toward the achievements of males (Tetreault, 1986, as cited in AAUW, 1992); cultural and social influences such as the media and parents that create expectations of passive behavior for young females; and peer pressure that sends messages among the school population as to acceptable female behavior (AAUW, 1992).

Preceding the *Shortchanging Girls, Shortchanging America* by nine years and laying the foundation for it, was *In a Different Voice* by Gilligan (1982), Harvard's first professor of Gender Studies. It is generally considered the first book to celebrate the differences of male and female psychology and challenge many of the prevailing theories on psychological development. In it, Gilligan says that psychologists have been making comparative studies of male and female development since Freud, but since the vast majority of researchers are men, the stages and scales were virtually always derived from male subjects. The thinking patterns of women were generally seen as a deviation from the norm, leading to a valuing of male tendencies toward achievement and individuality, and a devaluing of female tendencies toward nurturing and building relationships (Gilligan, 1982). A study discussed in *In a Different Voice* states that males, when given a situation in which they must make a moral judgment, generally approach it almost mathematically, weighing the importance of the competing factors and using a series of logical steps to reach a decision. Females, on the other hand, tend to be less definitive, ask more questions, and negotiate (Kohlberg, 1958, as cited in Gilligan, 1982). Since morality based on universal principles of justice is its highest form (Kohlberg, 1981) it would appear that masculine morality is mature and desirable and feminine morality is

less developed and undesirable.

With *In a Different Voice*, Gilligan (1982) countered this idea with the hypothesis that men and women have different kinds of moral reasoning and they are equally valid. According to her, men have justice-based morality and women responsibility-based. Men will tend to seek what they believe to be right, no matter what the consequences, using individual rights versus rights of others as a guide. Women will tend to view what is at stake and make the decision that is most responsible toward others and personal relationships. She calls this the Ethic of Care (as opposed to the Ethic of Justice) and describes her reasoning for it as such: "The moral judgments of women differ from those of men in the greater extent to which women's judgments are tied to feelings of empathy and compassion and are concerned with the resolution of real as opposed to hypothetical dilemmas." Because of this "Ethic of Care," women often prefer to remain quiet or act in such a way that will not risk upsetting a relationship (Gilligan, 1982).

However, because male psychological development has long been the dominant model for desirable adult behavior and males the dominant force of western civilization, those institutions that prepare people for adult life have subscribed to a male morality and ignored the female point of view (Gilligan, 1982). Though she does not come out and say it, Gilligan strongly implies that girls are at a disadvantage in the educational system. By her reasoning, schools, as an agent of Western Civilization, have a built-in male bias so girls do not receive the teaching methods, learning environment, and room to express themselves that would allow them to thrive. It was this idea that *Shortchanging Girls, Shortchanging America* (AAUW, 1991) built upon to make underachieving girls the main focus of educational discussion in the 1990s.

This focus resulted in books such as *Reviving Ophelia,* by Pipher (1994) that provides insight into the adolescent female's state-of-mind. Pipher, a clinical psychologist, relates stories of her patients and connects them to larger issues of gender socialization. Most upsetting to Pipher is the transition from childhood into adolescence,

when a strong, confident girl becomes a fragile, moody teenager, full of self-doubt. Pipher speaks of the real-self and the false-self. Prior to puberty, girls are true to their interests and act with little regard to how others perceive them with the exception of their parents. With the onset of puberty, other's opinions become the dominant influence. Particularly those, if not exclusively, of friends and school peer groups. As girls seek to fit in and match media driven expectations they lose touch with their real selves and any passionate interests and become what they believe is an acceptable version of them.

In a Different Voice (Gilligan, 1982), *Shortchanging Girls*, *Shortchanging America* (AAUW, 1991) and other writings with related topics, have recently come under fire by Christina Hoff Sommers, a fellow at the conservative American Enterprise Institute and a former professor of philosophy at Clark University. In a four-part article in the *Atlantic Monthly* (Sommers, 2000) and in her book *The War Against Boys: How Misguided Feminism is Harming Our Young Men* (Sommers, 2000), she asserts that much of Gilligan's research is anecdotal and the data taken from groups far too small to make any conclusions generalizable to a greater population. She also cites an article in *Science News* (Bower, 1991) that quotes psychiatrist Philip Robson in a 1990 Harvard Mental Health Newsletter that says there is no common definition for self-esteem or an agreed upon method of measuring it. Most importantly, she relates that by virtually every measure girls are doing better in school than boys. They get better grades (Dwyer, 1997, as cited in Sommers, 2000), come to class better prepared (National Center for Education Statistics, 1994, as cited in Sommers, 2000), take part in more extracurricular activities (Higher Education Research Institute, 1991, as cited in Sommers, 2000), and more of them are going on to college (Lewin, 1998, as cited in Sommers, 2000). As for the difference in morality, she cites a study (Walker, 1984, as cited in Sommers, 2000) that reported on 108 studies regarding sex difference and solving moral dilemmas and found that differences in adolescents are rare. She also cites an Oberlin College study (Friedman, 1984, as cited in Sommers, 2000) that found "no reliable sex differences" in

moral reasoning. Sommers also writes that the studies conducted by Gilligan have never been replicated because they have never been published, and are still unavailable for peer review over fifteen years after the publication of *In a Different Voice*. The main thrust of *The War Against Boys* is that because of radical feminism, the public education system has turned a blind eye to the troubles of boys and allowed a feminization of the school system in an attempt to bring gender equity to the schools (Sommers, 2000).

Rotundo (2000), in a review written for *The Washington Post*, said of Sommers' work, however, "Examined carefully, Sommers's case does not hold up well. She persistently misrepresents scholarly debate, ignores evidence that contradicts her assertions, and directs intense scrutiny at studies she opposes while giving a free critical ride to research she supports." He says of Sommers's reliance on biological determinism to argue that boys are more aggressive by nature, that she is "treating it as if it were a settled issue among scholars in the field. In fact, the debate on this topic is lively and far from conclusive." He also points out that the first and best-known study of male underachievement was done by the American Association of University Women, something Sommers fails to reveal in her book. He sums up his review with the statement: "Sommers's book is a work of neither dispassionate social science nor reflective scholarship; it is a conservative polemic".

Also, in his review of *The War Against Boys*, Rotundo (2000) states that studies of differences between the sexes tend to find greater variation within in each sex than between the averages of each sex. This would seem to undermine Sommers use of biological determinism and Gilligan's "different voice". Other sources also bring information that challenges both the work of Sommers and Gilligan. An article in *Science News* (Bower, 1991) which Sommers cites for showing a lack of agreement on measuring self-esteem, also states that though the drop in female self-esteem is largely agreed upon, the causes are not. Other theories according to psychologist John Offer of Northwestern University include parenting styles, the earlier onset of puberty in girls,

mother-daughter relationships, girls' social skills and interactions, and their family life (Bower, 1991). This would seem to counter Gilligan's belief that the self-esteem drop is caused by a girl's smothered "voice" and Sommers's contention that the drop does not occur at all. Finally, despite what Gilligan, the AAUW, or Sommers have to say, Bracey (1997) in an article in American Heritage states that American public schools have been improving by virtually every measure since the 1950s. The percentage of graduates and those going to college has increased, the percentage of dropouts has decreased, and SAT scores continue to rise.

In order to gain some further insight into gender equity, it might be helpful to find some studies that discussed it before it became a nationwide controversy. A brief overview of scholarly works shows that prior to the 1990s other researchers were studying both sides of the issue and finding problems with both sexes. A study by Todd (1979) on social adaptation of high school boys, found that of those who were neither trouble makers or highly involved in school, "Few of these boys were pleased with their futures or the high school experience, for that matter, but seemed resigned to both." A study of 396 North Dakota vocational teachers by the State Board for Vocational Education (Dittman, 1976), found their attitudes towards men and women to be highly stereotypical and "these perceptions are unavoidably influencing the ways in which these educators are viewing students present and future possibilities." Davidson and Lang (1960, as cited in McClintock, 1979) found that students who perceived the teacher liked them performed better and girls rated themselves as being liked more often than boys. In the same study they found teachers rated girls as better students. Smith (1972) put forth that despite schools being a feminine environment, boys grow intellectually by gaining a sense of independence and finding their competencies elsewhere. Girls learn dependent and compliant behaviors because the teacher constantly reinforces them. Griffiths (1985) in a piece called "The Exclusion of Women From Technology" for the book *Smothered by Technology: Technology in Women's Lives*, demonstrates historically how women,

once the major creators of technology, in the form of agriculture and home arts, slowly lost that position as the Industrial Revolution moved it from the home to the factory. When that occurred, women, as property of their husbands, were unable to generate the necessary capital needed to take part in setting up mass production. They were destined to be the laborers instead. From very early on, women were at a deficit with modern technology. It is with this thought we move to the next section.

Gender Equity and Technology Education

In a letter to J.H. Francis, the Superintendent of Los Angeles City Schools in 1912, C. A. Kanou, a manual arts teacher, asked that girls be included in manual training classes. Kanou thought it would be beneficial to the girls and also believed "...that neither in organic or moral law is there any reason they should not be allowed to take this kind of work...". Kanou was told by Francis to "Try it in a limited way..." (Kanou, 1912, as cited in Gloekner, 1997)

Despite all the controversy surrounding gender equity, something is definitely happening in Technology Education classes regarding female enrollment. Classes remain overwhelmingly male with female averages hovering around 10%, with the exception of graphic arts and communications, which have female populations as high as 50%, according to a relatively recent study done by Flowers (1994, as cited in Gloekner, 1997). The teachers are also mostly male, calculated at 93% by a random sampling of the Industrial Teacher Education Directory published by the Council for Technology Teacher Education and the National Association of Industrial Teacher Education (Gloeckner, 1997). Several universities and state departments of education are putting forth resources to study why this is and what can be done about it. Many of these projects are still underway so conclusions cannot yet be made.

Adding difficulty to the issue of girls and technology is a dearth of scholarly work on Technology Education in general. In her piece *Thoughts on Technology Education*

Research, Zuga (1999) makes the case that the discipline's database is limited and weak. This was her third review of Technology Education related research and her conclusions virtually remained unchanged from the first and second ones. The main reason for this is that relatively few academics choose technology education as the sole focus of their research. There is far more to research to be done than there are people to do it. Those who do carry out research tend to use a limited amount of methods. Moreover, the research is largely dedicated to curriculum development and status and very little work is done regarding the effectiveness of Technology Education. It is not truly known whether students really are learning what educators want them to learn (Zuga, 1999).

Despite this shortage of research, there were some relatively comprehensive studies in the 1980s and 1990s measuring perceptions of technology. Raat and deVries (1985, as cited in Boser et al, 1996.), while working in the Netherlands to create a curriculum that linked technology and physics, measured students attitudes toward technology by means of a questionnaire. The project, entitled *Pupils' Attitudes Toward Technology* (PATT) made three conclusions: (a) students had only a vague concept of technology (b) the relationship of technology to physics was very obscure, particularly among females, and (c) girls are less interested in technology and see it as less important.

The questionnaire was revised and a similar study was done in the United States by Bame, Dugger, deVries and McBee (1993). PATT-USA found that American students are interested in technology and strongly aware of its importance. Both sexes also think technology is a field for men and women, girls even more so than boys. The influence of parent's professions and the presence of technology in the home have a positive effect on perceptions of technology. Still, in general, girls find the classes and the concepts less interesting than boys (Bame et al., 1993).

In 1996, the PATT-USA was taken one step farther and used to "ascertain if selected instructional approaches used by technology teachers affect the attitudes of middle school students toward technology" and "to determine whether males and females

respond differently to these instructional approaches". The questionnaire was given at the beginning and at the end of a nine-week session. Four groups were tested, each having undergone a different instructional method. While it was found that the different instructional methods did affect attitudes, the results regarding gender were little different from the previous PATT studies (Boser, Palmer, and Daugherty, 1996).

Among the most comprehensive studies on females and Technology Education is *Building Their Future: Girls and Technology Education in Connecticut* by Silverman and Pritchard (1996). In it, they examine teaching methods, classroom organization and environment, and teacher interaction with girls. Their methodology was to observe the classroom, meet with focus groups of girls, interview staff, and survey both male and female high school students with a six-question instrument.

The authors found that in middle school girls largely enjoyed technology education, particularly the hands-on aspects. They also found that despite having less experience with tools on average, they caught on and performed as well as the boys in the long run. They also found, however, that there was an underlying sexism in classes and often teachers had not developed strategies to combat it. For example, boys would dominate tools and supplies. They would also make fun of girls using tools. Due to the informal nature of most technology education labs, interactions occurred between boys and girls that would not occur in other classes. Girls also found some of the projects less appealing than boys, such as CO2 cars and model rockets. They were perceived as male oriented (Silverman and Pritchard, 1996).

Probably the most startling finding, and an interesting contrast to the results of PATT-USA, was that girls did not see technology as a field they would be interested in, largely because men dominate it. They seemed to hold to traditional stereotypes of male and female roles. The study also found that girls and boys were unaware of career possibilities and the world of work. They did not have a sense of earning potential, advancement or what skills were needed to succeed in various fields. Compounded with

the traditional view of the work world this puts girls at a definite disadvantage in technology education classes (Silverman and Pritchard, 1996).

Girls also reported being discouraged to take technology education classes far more than boys did. When asked who discouraged them they listed peers, family, counselors and teachers. It should be noted that this in and of itself does not represent bias toward females but it may instead represent a bias toward technology education. Silverman and Pritchard also describe a type of female student they referred to as a "pathbreaker". This is a girl who likes to take technology education classes and revels in proving that girls are just as good as boys are in non-traditional subjects. They generally did not feel that boys made it difficult for them, but were concerned that teachers would treat them differently (Silverman and Pritchard, 1996).

Some other studies also found similar conclusions. Knowlton (1996, as cited in Gloekner, 1997), using focus groups of middle school and high age girls found that some did not think they would need technical information and believed that their husbands would take care of them. Her subjects saw little value in courses that did not prepare them to raise a family. Females saw only a minor connection between technology education and their future adult roles. Koch (1994) touched on some interesting points in an article for *Education Digest*. While discussing gender and technology education enrollment she makes the point that it isn't always the fault of the teacher or the chilly climate but rather that technology education must compete with art, music, and foreign language and this discourages participation.

It would seem remiss to not review *Student Perspectives on Technology and Technology Education* by Paniagua (1999), for it has supplied this research project with its survey instrument. While it reinforced much of PATT-USA (Bame et al., 1993) and Silverman and Pritchard (1996), it also found other trends. Boys were most interested in learning about how technology works whereas girls were interested in this the least. Girls were most interested in learning about technology as people connectors, meaning

they answered positively to questions that asked if they wanted to learn how to use technology to "help people work together, meet and stay in touch with other people, and makes it possible to visit others who live far away". Boys were interested in this aspect of technology the least (Paniagua, 1999). These findings are backed by a project done at the Center for Children and Technology (as cited in Koch, 1994) in which researchers asked both male and female technical experts to imagine future technological developments in their field. The women envisioned devices that connect people, improve communication and collaboration, integrate public and private lives and improve on existing technologies. The men on the other hand tended to talk about unlimited power, tremendous speed and absolute knowledge.

The Wisconsin Department of Public Instruction has been working on the TACKLE Box Project (Technology Action Coalition to Kindle Lifelong Interest) for four years. This is a statewide initiative to attract more young women to vocational and technological careers. DPI identified five major reasons for low female enrollment, and these are very similar to the UUAW report, *Shortchanging Girls, Shortchanging America* (1991) and Silverman and Pritchard (1996). They are: classroom climate, social fit, curriculum and instruction, role models and mentors (or lack thereof), and messages from counselors. The main goal of the TACKLE Box Project was to compile a number of strategies to increase female enrollment. The list is quite long but an example solution for each of the above identified problems, respectively, includes: 1) Keeping classrooms neater and establishing rules for classroom interaction; 2) Encouraging early-grade hands-on activities and recruiting girls in groups for technology education classes; 3) Connecting curriculum to the real world and to other disciplines; 4) Encouraging job shadowing of a women in technological fields and using high school girls to recruit middle school girls for classes; 5) Better educating parents and counselors to the roll of technology education in the college bound student and more information about comparative salaries (WDPI, 2001)

At the same website, graphs showed that overall female enrollment in Technology Education has increased from 9.4% in 1984 to 18% in 1999. In grades 11 and 12, when possible careers are getting the most serious consideration during public schooling, the amount of girls enrolled in Technology Education has gone from 3% in 1995 to 6% in 1999 (WDPI, 2001). It would be interesting to find out if the percentage has continued to grow in the two years since.

Summary

In reviewing the literature it was shown that issues of gender equity are controversial. Girls were shown to have a drop in self-esteem in the middle school years that affects their performance. However, some of these findings are coming under scrutiny for lack of empiricism. Other research shows that it is the boys who are falling behind in the school system. These findings, however, are seen by some as politically motivated. Examining studies done before 1990, evidence was found that supported both sides of the argument.

There is an overall shortage of technology education related research and papers regarding gender equity in the technology education classroom tend to cite from the same set of researchers. However, the research on students' perceptions of technology and Technology Education have shown some consistent findings:

1. There is low female enrollment in technology education classes compared to male enrollment.
2. Boys tend to view technology as an object.
3. Girls tend to view technology as something to use.
4. Girls are less interested in technology education classes.
5. Girls are less interested in how technological systems work.
6. American males and females see technology as a field for both genders.

CHAPTER THREE

Methodology

Sample Selection

The subjects of the study were students enrolled in the spring semester, 2001 sixth grade Technology Education course at Kennedy Middle School and who were willing to participate. The author and one other department member at Kennedy Middle School teach these classes. The sample pool consisted of eight classes with anywhere from 16 to 24 students, making a total sample size of 147. Classes varied in proportion of males to females. However, the sample is split more or less evenly with 77 boys and 70 girls. As it is a required class, all students were placed by how the course fit with their overall class schedule, creating a random sample.

Instrumentation

As was stated in Chapter One, the instrument was developed in 1999 by a Technology Education graduate student at the University of Wisconsin-Stout, and was used to survey seventh grade students in Milwaukee. Designed to measure students' interests and perceptions of technology and Technology Education, it was initially field tested in a middle school with no Technology Education program. The content was derived from student input and a Wisconsin DPI publication: *A Guide to Middle School Curriculum Planning in Exploring Life's Work.* The instrument is divided into four sections and contains 29 questions. Two questions were not needed for this study.

Section 1. This is an open-ended question that seeks to discover how boys and girls differ in their perceptions of technology. It asks them to write down what they think when they see or hear the word technology.

Section 2. This was designed to measure a student's interest in technology. There are eighteen questions divided into six categories and measured on a four-point Likert type scale. All questions begin with "I would like to..." The range is "Not

Interested", Somewhat Interested", "Interested", and "Very Interested".

Section 3. The third section of the survey is designed to measure students' perceptions of the Technology Education classes and their willingness to enroll in them. The first six questions begin with "I think the technology education class in our school is mostly about…" They are designed to assess the extent to which students think the classes align with the six categories from section 2 of the survey. The responses are on a four point Likert type scale with a range from "Strongly Agree", "Somewhat Agree", "Somewhat Disagree", and "Strongly Disagree".

The seventh question of section three is designed to assess student interest and willingness to enroll in classes. It begins with, "The Technology Education class at my school…" and offers four responses. They are: 1) Matches interests and will probably sign up. 2) Does not match interest but will sign up anyways. 3) Matches interest but will probably not sign up. 4) Does not match interests but will probably sign up anyways.

Section 4. The last section is for demographic purposes. The only question applicable to this study is whether the subject is male or female, so that responses could be compared between girls and boys. The other two questions, grade level and whether the subject had taken any previous technology education classes were disregarded. It was clearly established that all subjects were in sixth grade and that none had taken any classes of this type before this one.

Pilot Study. Two computer classes were given the survey in order to better understand how sixth graders might respond to it. Recurring errors were found often enough for the researcher to feel the need to write specific emphases into the instructions.

Procedures

The Perspectives of Technology Survey was administered on eight separate occasions by the researcher in late May 2001. The survey instrument was first given by the author to his four classes. Since sixth grade Technology Education classes meet every other day the survey was given over two consecutive days. Then, as a part of the curriculum, the two Technology Education teachers exchanged classes. A five-day unit was taught and the second group of four classes completed the survey over two consecutive days. It was believed that giving the students several class periods to get to know a new teacher would help make the experience more similar to those students who had had the teacher all semester. This would also diminish the novelty of a new setting and allow the students to become more comfortable.

The researcher began by reading the same set of instructions to all eight groups. The surveys were handed out and the students were given the necessary time to complete it, approximately 15-20 minutes. The surveys were then collected and stored until they could be compiled. (See Appendixes A, B, & C)

CHAPTER FOUR

Results and Discussion

Introduction

The purpose of this descriptive study was to identify the extent to which perspectives on technology differ between boys and girls in a sixth grade class. Using an instrument, the students were surveyed for their perception of the word technology, overall interest level in technology and Technology Education, and perceptions of the course content.

Only 5 of the 147 surveys were deemed completely unusable because students failed to mark the "boy" or "girl" box in section four. Section one was analyzed independently from the rest of the survey because some students wrote down more than one answer, some students wrote down answers in section one but missed a question in sections two or three, and a number of students missed section one entirely but filled out the rest of the survey correctly. It was thought by the researcher that since section one was an opened-ended question and gathered descriptive data, and sections two and three gathered discrete data, separating the responses would maximize the sample number for each data set without radically changing the results. It was, after all, the intention of most students to fill out the survey correctly and make their opinions heard.

Section One Results

Section one corresponded to research question one, "How do boys and girls differ in their perception of technology?" Section one asked the students to finish the question, "When I read or hear the word technology I tend to think of...". The responses were sorted into five categories of technology: object, such as a machine or tool; process, such

as construction or manufacturing; knowledge, such as learning how things work; futuristic, such as a description of what is to come; and other. One hundred and eleven surveys were eligible for inclusion. The responses were categorized using the Paniagua (1999) study as a guide. This study received very few different answers and those it did were not difficult to place.

For male students, 61 surveys had one or more answers for section one, making a total of 94 responses. The object category was by far the most common, totaling 68 of 94 responses or 72%. Computers were the most commonly named object with 31 responses or 46% of the total category. Other notable objects by males were electronics (ten), machines and mechanical devices (six) and cars (five). All other objects had four or less responses. The other categories had no more than four identical responses for any given entry. (See Appendix D).

For female students, 57 surveys had one or more answers for section one, making a total of 101 responses. Object was also by far the most common category, totaling 68 of 101 responses or 67%. Computers were also the most commonly named object with 28 responses or 40% of the total category. Other notable objects by females were electronics (eight responses), cars (six responses), and machines (five responses). All other objects had four or less responses. The remaining categories had no more than four identical responses, with the exception of the Other category, which had six "boring" entries. (See Appendix D).

The results of Section One supports research that early adolescent boys and girls are for the most part still concrete thinkers, nearly equally perceiving technology most frequently as an object. The male and female responses are very similar and percentages

quite close. Computers made up 40% of the females' and 46% of the males' object category. Even objects named less frequently, such as television, phone, and CD, appeared in fairly even numbers. The similarity extends to the other categories with knowledge, 8% female and 7% male; process, 13% female and 15% male; and future, 4% female and 3% male. Two females were the only ones to say appliance, and perhaps this says something about domestic gender roles. Girls also said "boring" six times when only one boy responded in this manner. It would seem, however, that the sample would have to be much larger for this question to show any significant differences, if any actually exist.

Section Two Results

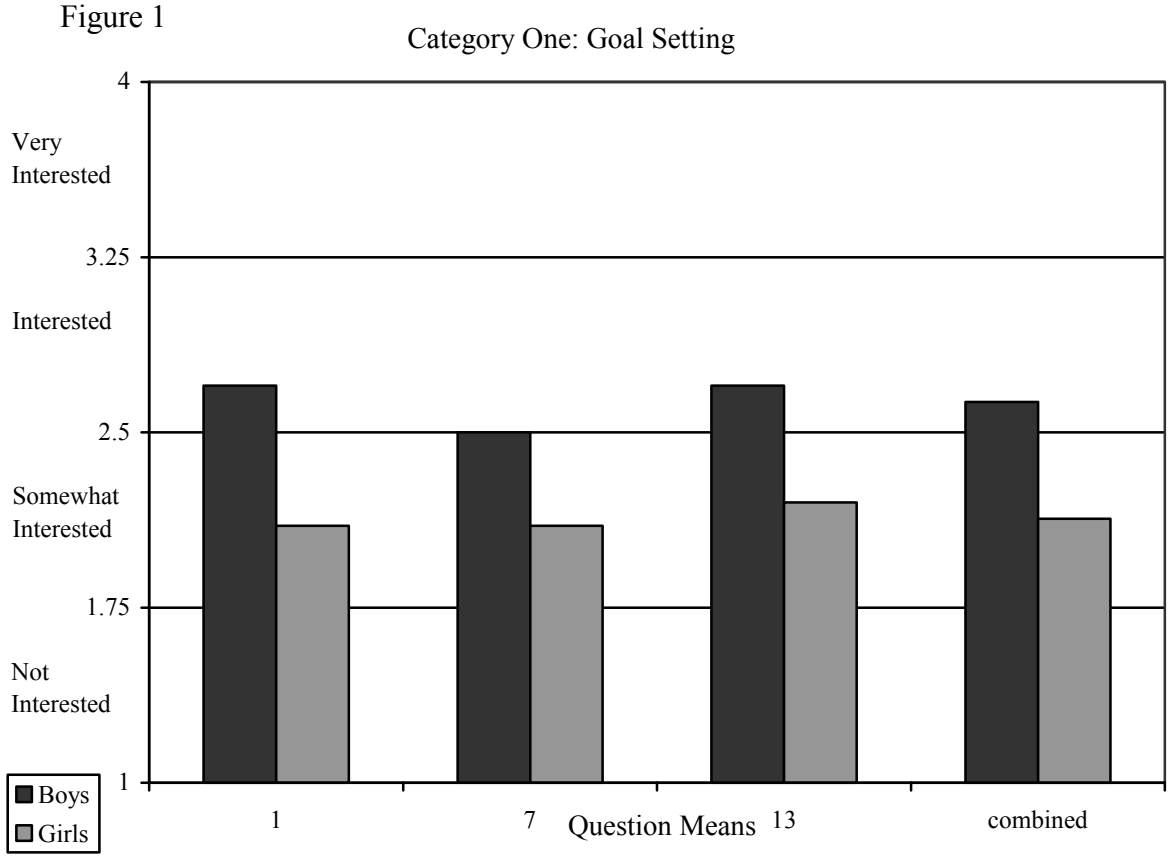
For section two, 128 surveys were eligible. In order to qualify, every question had to have been answered completely in both sections two and three. Males filled out 66 of the surveys correctly and females 62. Section Two had 18 questions answered on a four-point scale from "not interested" to "very interested". The questions of section two represent six categories of interest and each category corresponds to a research question from Chapter One.

The means for Section Two were calculated by giving a value of one point for every answer in the "not interested" rating, two points for every answer in the "somewhat interested" rating, three points for every answer in the "interested range" and four points for every answer in the "very interested" range. The total points were then divided by the number of surveys to obtain a mean score for each question. This gave an average interest level for each question. "Not interested" ranges from 1 to 1.75. "Somewhat interested" ranges from 1.75 to 2.5. "Interested" ranges from 2.5 to 3.25. "Very

interested ranges from 3.25 to 4. The three question means were combined to create a single category mean.

Category one is goal setting and corresponds to research question two, "To what extent are boys and girls interested in learning about technology to prepare for Academic or career choices?" It surveyed student interest for academic planning or how a student may be interested in technology insofar as education and career decisions. Questions 1, 7 and 13 measure this. See Figure 1.

Figure 1

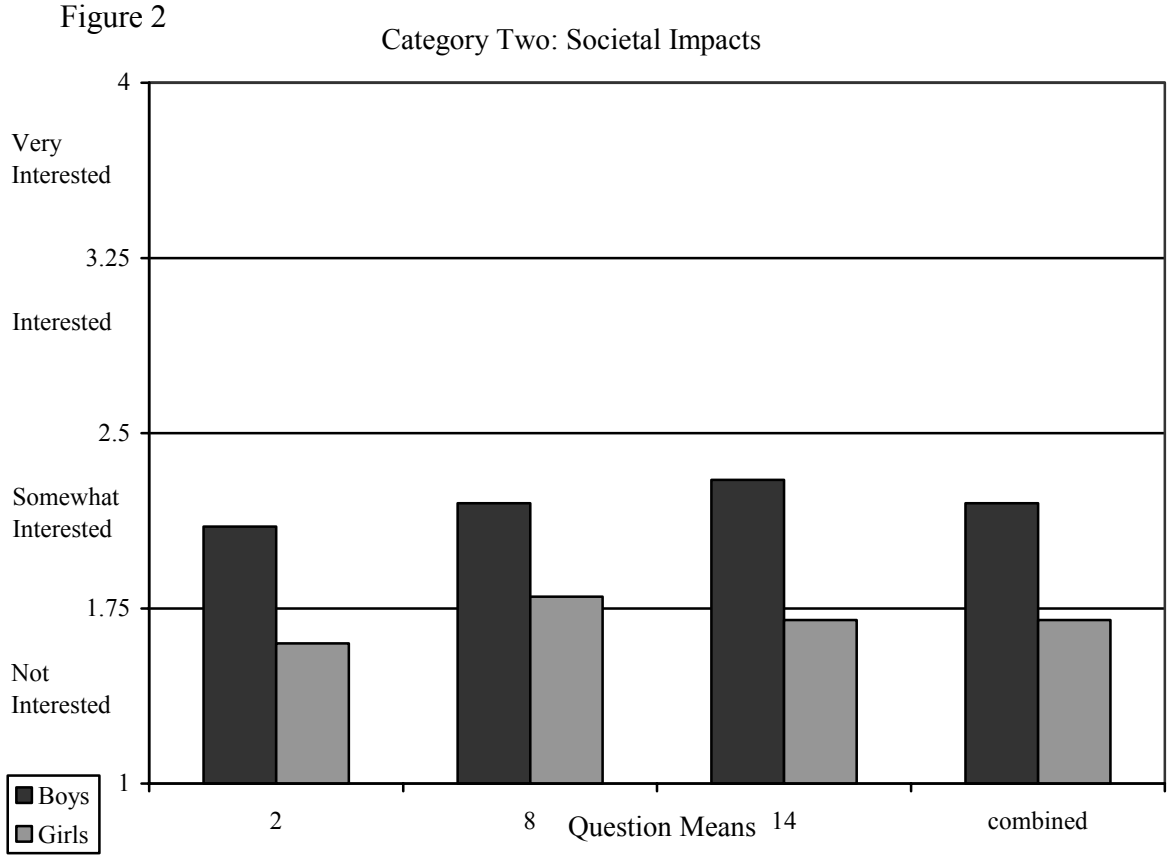


All of the boys' question mean scores are close together and make a category mean score that is slightly into the "interested" range at 2.6. The girls' mean scores on the questions are also close together and make a category mean score of 2.1, putting it

firmly in the “somewhat interested” range. The girls’ scores are all noticeably lower but not significantly lower than the boys' scores. This aligns with research that says many students don’t have an understanding of what skills they will need for the adult world of work. This also might be because sixth-grade students may perceive adulthood, even high school, as very distant and may also perceive work and careers as "not fun"

Category two is societal impacts and corresponds to research question three, “To what extent are boys and girls interested in learning about societal impacts of technology?" It surveyed student interest in regard to learning about the technological environment in which they and their communities live. Questions 2, 8 and 14 measure this. See Figure 2.

Figure 2



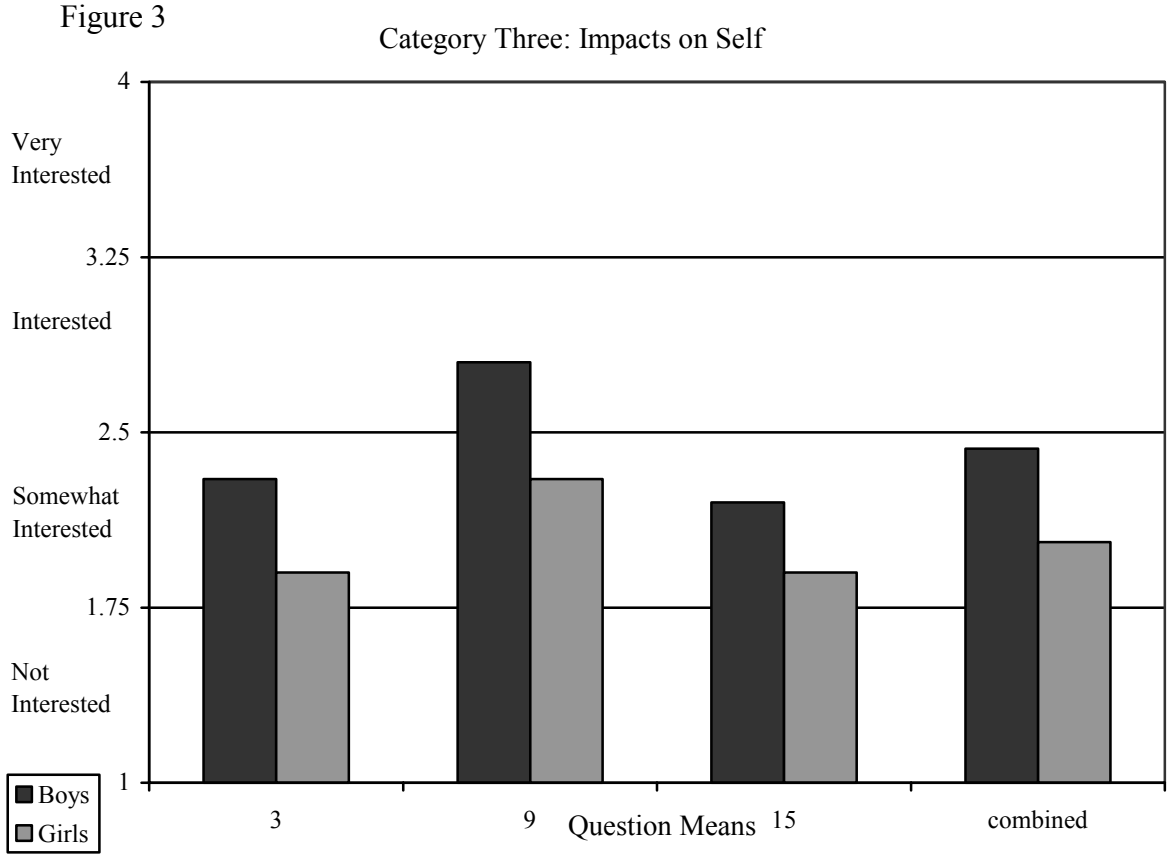
The boys' question mean scores are again close and make a category mean score of 2.2, or the "somewhat interested" range. The girls' mean scores on the questions are also close and make a category score of 1.7, at the very top of the "not interested" range. It appears that neither sex is very interested in learning about how technology affects other people and the natural world. In fact, the "very interested" range of question two on the female surveys was the only area to receive zero responses in the whole study. The review of literature showed that girls are concerned about relationships, but from these results they are apparently very uninterested in learning about technology and the people around them. This is the lowest scoring category overall for both sexes. However, these results would seem to fit with the idea that middle school students have an egocentric learning style as mentioned in Chapter two.

Category three measures impacts on self and corresponds to research question four, "To what extent are boys and girls interested in learning about technology as it pertains to their lives?' It surveyed student interest in terms of learning about the impact of technology on themselves, or concerns they may have about technological systems in their lives. This category is intended to address some of the inhibitions that often accompany a low knowledge level of technology (Paniagua, 1999). Questions 3, 9 and 15 measure this. See Figure 3.

The question mean scores had a wider spread with 9 being approximately 0.5 higher than 3 or 15 for both sexes. The idea of exploring what technology might look like when they get out of high school must have captured some of their imaginations, particularly for the boys who scored solidly "interested". Overall, this was fairly low

scoring category, above only category two, with a boys' category mean of 2.4 and a girls' category mean of 2.

Figure 3

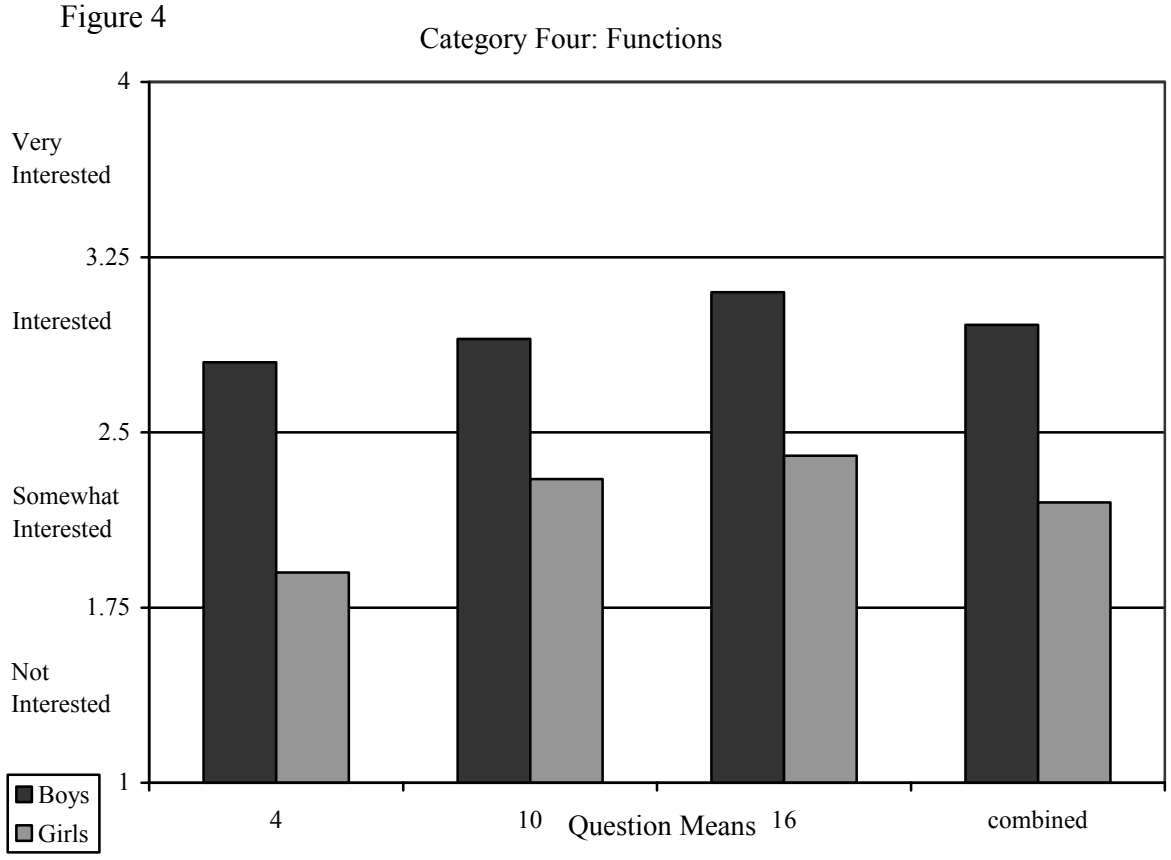


Category four is functions, or how various technologies are used. It corresponds to research question five, "To what extent are boys and girls interested in learning how technology can be used?" This category is intended to measure some of the previously documented gender differences in perceptions of technology (Paniagua, 1999). Questions 4, 10 and 16 measure this. See Figure 4.

This was a fairly high scoring category with all male mean scores falling into the "interested" range. The girls mean scores were approximately 0.7 lower than the boys,

but still higher than the three other girls' categories. Many members of both genders would seem to be interested in learning how to use more technology in their lives.

Figure 4

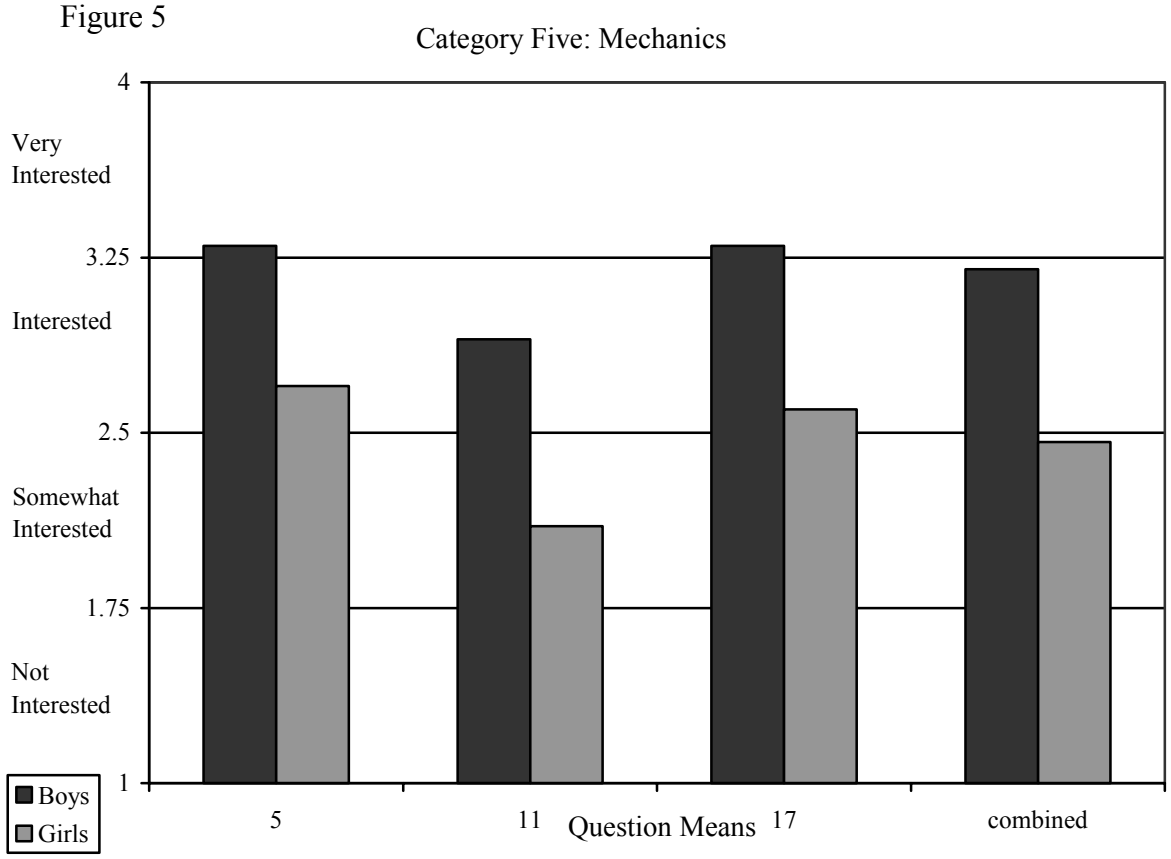


Category five is mechanics, or how interested students are in learning how things work or are made. It corresponds to research question six "To what extent are boys and girls interested in how technology works". This category, like category 4, is intended to measure some of the previously documented differences in perceptions of technology. Questions 5, 11 and 17 measure this. See Figure 5.

This was the highest scoring category overall with a boys' mean score of 3.2 and a girls' mean score of 2.5. The two highest male question scores can also be found here on 5 and 17. The responses to question 5 seems to strongly indicate that the students

enjoyed their time in the woodshop and would like to do more hands-on projects that involve making something. Question 17 is almost as high, so it appears both males and females would like to "tinker" more with the inner workings of machinery. This supports the research of Silverman and Pritchard (1996) who found that girls like the hands-on aspects of Technology Education and though they may not initially feel at ease in the shop setting, they do catch up and ultimately enjoy it.

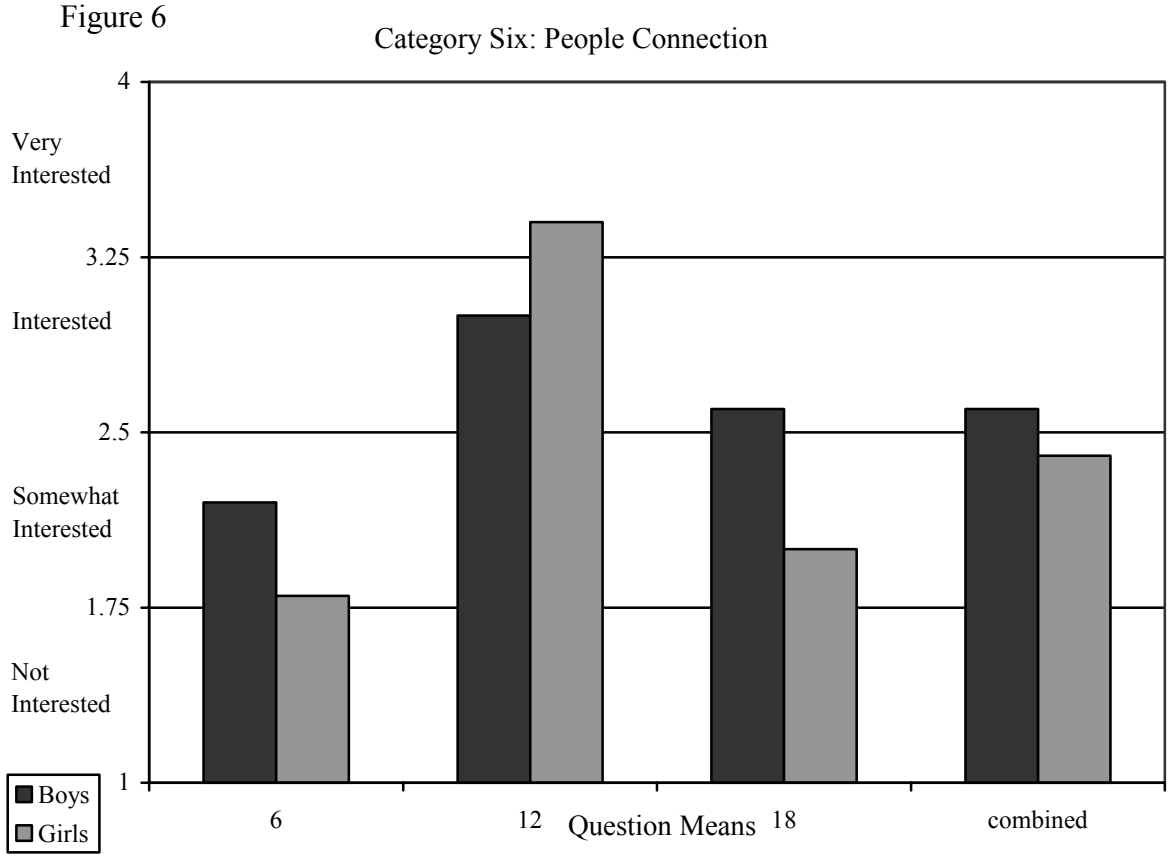
Figure 5



Category six is people connection and corresponds to research question seven, "To what extent are boys and girls interested in technology as people connectors?" It surveys how interested students are in learning how technology connects people together. This category is intended to measure research findings that relationships contribute to the

perspectives of adolescent girls (Paniagua, 1999). Questions 6, 12 and 18 measure this. See Figure 6.

Figure 6



This category had some very interesting results. The overall category mean scores for both sexes were not particularly strong but question 12 on the female surveys produced the single highest response in the whole study. With a mean score of 3.4, the prospect of meeting and staying in touch with other people was apparently very interesting for girls. The boys mean score on question 12 was 3.0, second only to mechanics, showing that they, too, are fairly interested in using technology to build and strengthen relationships as well. Questions 6 and 18, though similar, did not seem to interest either sex very much with question mean scores about 0.5 lower for the boys and

1.5 lower for the girls. Why there is a large difference in the question means is unknown. The female result of question 12 certainly seems to indicate that middle school girls prize the social aspects of living and relationships just as Gilligan (1982) wrote. What the researcher found very interesting was that on some surveys every question was marked "not interested" and question 12 would receive a "very interested".

All 18 question scores were combined into one total mean score that represented the overall interest level in the course. The total mean score for boys is 2.7 or on the low side of the “interested” area for the boys. The total mean score for the girls is 2.2 or the high side of the “somewhat interested” area. This is in keeping with previous research that has found boys are more interested in Technology Education than girls. However, it also shows that girls are not completely disinterested and this gives good reason to put resources into attracting more of them into the program. It also shows the Kennedy Middle School Technology Education Department is not interesting sixth grade students to the greatest potential and should explore some curriculum revision.

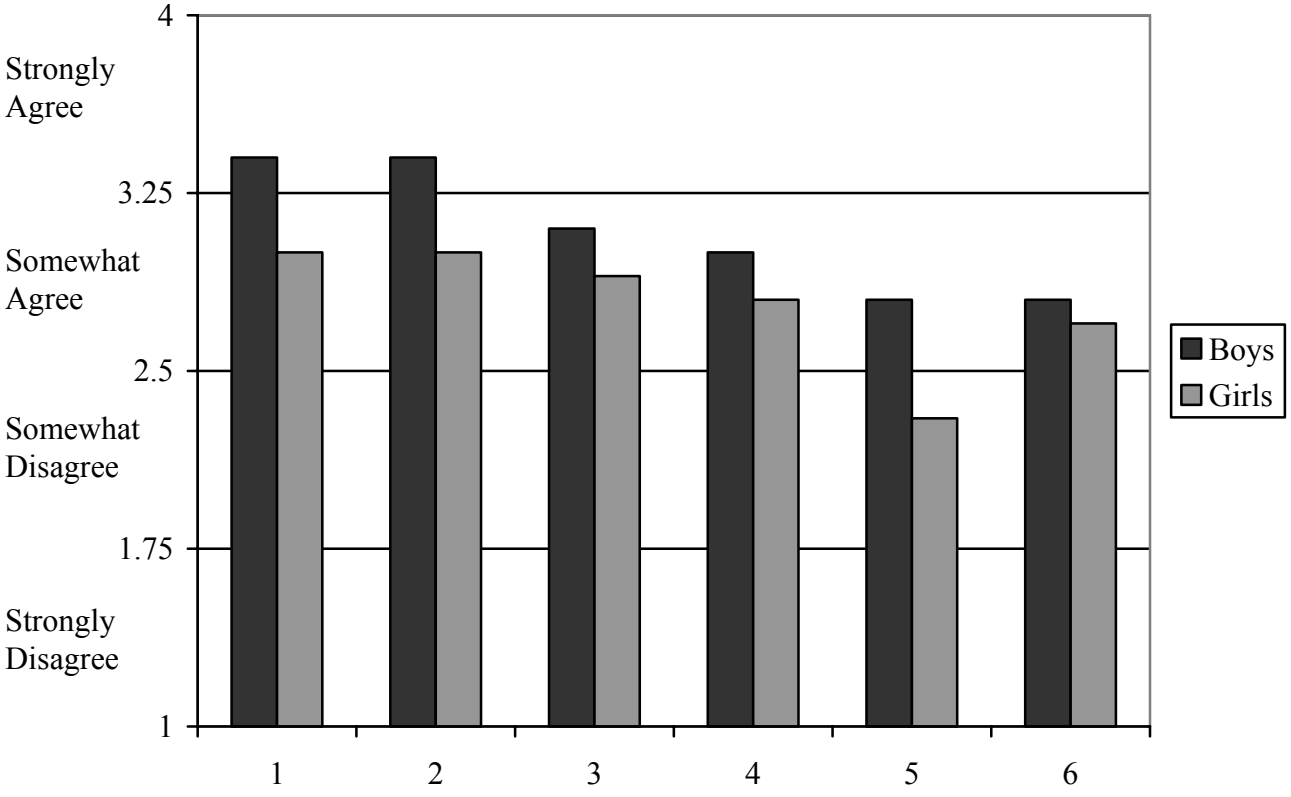
Section Three Results

The first six questions of section three measured students perceptions of the content of the course and how closely the course matches their interests. These questions correspond to research question eight, “To what extent do current technology education classes support students’ interests in technology?” The results were compiled exactly the same way for as section two. They were calculated by giving a value of one point to every answer in the “strongly disagree” rating, two points to every answer in the “somewhat disagree” rating and so on. The total points were then divided by the number of surveys to obtain a mean score for each question. This gave an average interest level

for each question. "Strongly disagree" ranges from 1 to 1.75. "Somewhat disagree" ranges from 1.75 to 2.5. "Somewhat agree" ranges from 2.5 to 3.25. "Strongly agree" ranges from 3.25 to 4. Section three results were compared to section two, but only in a descriptive fashion. The actual numbers have no true correlation. This is to say that if an interest mean of 2.8 corresponds to an agreement mean of 2.8 that they match, or in other words, that we are teaching exactly as much as they are interested in learning about a given topic. This is not at all the case. The numbers act simply as a guide to help gauge the student's different perceptions and feelings toward the class. See Figure 7.

Figure 7

Perceptions of Course Content



The first question asked if the Technology Education class helps with high school and career planning. The results, a 3.4 mean for males and 3.0 mean for females are encouraging. The Kennedy Middle School Technology Education department tries to incorporate this into the curriculum and it appears to be somewhat effective. However, this is of only medium interest to the students.

Question two asked if the class is learning about the impacts of technology on society. Both sexes had a mean of 3.4, making this question the most strongly agreed with of the six. The Kennedy Middle School Technology Education department has definitely worked to make this a part of the curriculum. Unfortunately, however, this is the single lowest ranking category in section two, meaning very low interest level. It is unfortunate that more students are not interested in this area as this may be the way they will encounter technology the most as it changes their life and environment.

Question three asked if the students think they are learning about technology in their lives. This also had a medium level of agreement but a low level of interest, second only to impacts on society in amount of disinterest. One possible reason these last two categories score a low level of interest is because at this time the Kennedy Middle School Technology Education department uses a conventional means of delivering the information. The teachers lecture while the students remain in their desks. If some more engaging activities could be found to teach these concepts they might generate more interest.

Question four asked if the class is about learning different ways to use technology. Both sexes are still within the “somewhat agree” range but are lower than the previous three questions. This was second highest area of interest for the boys and

the third highest for girls. Still, this may be the closest match of student interest and course content.

Question five asked if the course was mostly about making things and how things work. This had the greatest disparity between interest level and agreement. Students had the highest interest in this area but the lowest agreement that the course was mostly about this. This will be taken into consideration as the Kennedy Middle School Technology Education department refines the course curriculum for the upcoming school year. The results would seem to show that the students are being disappointed by the course content and not allowed enough "shop time" and other hands-on activities.

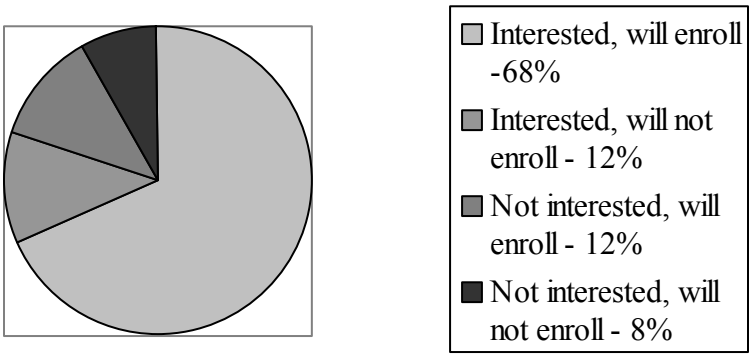
Question six was the people connection question, specifically designed to peak the interest of girls. As shown before, girls were indeed very interested in this but were at the low side of "agreement" on the scale. This is a more difficult problem to solve, since beyond the Internet other forms of this are not immediately obvious. A more comprehensive unit on communication with some time spent on photography or video may possibly interest them more.

Finally, question number seven asked if this course matched the student's interests and would they enroll. This question provides the single most powerful piece of evidence in the difference of boys and girls and their perceptions of Technology Education. Sixty-eight percent of the boys marked that this class matches their interests and they would enroll. Only 8% said it did not and they would not enroll. For girls, the results are far different. Twenty-six percent of girls said the class matched their interest and they would enroll whereas 39% said it did not match their interests and they would not enroll. Interestingly enough, an additional 24% said it matched their interest but they

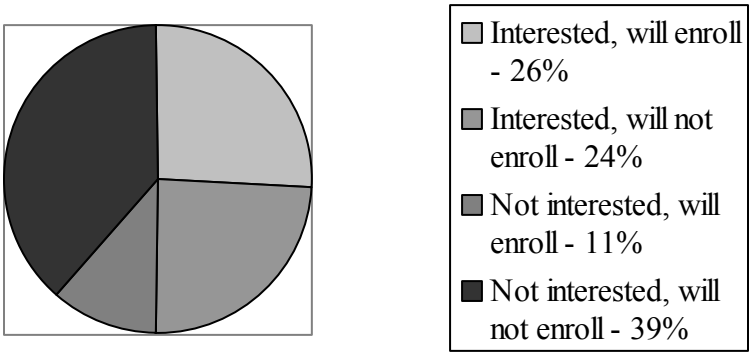
would not enroll. Despite these results, it still appears that half of the girls are interested in technology and Technology Education and that is no small number. See Figure 8.

Figure 8

Boys' Enrollment Potential



Girls' Enrollment Potential



Summary

To summarize the results of the responses of this sample population:

1. The boys were generally more interested in technology and Technology Education than the girls.
2. The boys and girls both enjoy hands-on projects and time in the shop.
3. The girls are more interested in the people connecting aspects of technology than boys, but boys are still fairly interested.

4. Boys and girls are fairly disinterested in the societal and environmental impacts of technology.
5. Significantly more boys than girls feel Technology Education class matches their interests.
6. Sixth grade boys and girls overwhelmingly view technology as objects.
7. Both boys and girls are only moderately interested in learning about career planning via Technology Education.
8. Boys are quite interested in the mechanical aspects of technology. Girls are not as interested but still scored higher than the other categories.
9. Boys are far more likely to enroll in Technology Education.

CHAPTER FIVE

Summary, Conclusions and Recommendations

Summary

The purpose of this descriptive study was to identify the extent to which perspectives on technology differ between boys and girls in a sixth grade class. The impetus for this was the low female enrollment in Technology Education at Kennedy Middle School in Germantown, Wisconsin. In sixth grade, Technology Education is a required class and has a female population of roughly 50%. However, in seventh and eighth grade, when Technology Education is an elective, the female population drops significantly, often as low as one or two girls per class. It was the hope of the researcher that by examining the different ways boys and girls perceive technology, that information could be used to help create a curriculum that would make Technology Education more attractive to females.

A review of literature showed that gender issues were the primary focus of educational discussion in the 1990s. The reason for this was very likely the release of *Shortchanging girls, Shortchanging America* by the American Association of University Women in 1991. This study reviewed hundreds of studies and found that girls were falling back in middle school and experiencing trouble with subjects in which they may have previously been successful. It has been largely accepted since then that girls suffer a significant drop in self-esteem during adolescence, but boys are not without problems either, so it is really not known which sex is at a greater disadvantage in the school system. Research concerning Technology Education, however, has shown a consistent pattern of greater male interest and success.

This study used an instrument previously developed for another thesis, and surveyed students regarding their perception of the word technology, overall interest level in technology and Technology Education, and perceptions of the course content. One hundred and forty-seven sixth grade students, 70 female and 77 male, participated in the study at Kennedy Middle School in Germantown, Wisconsin. It was open to all students who were enrolled in the spring 2001 semester of Technology Education and were willing to participate in the study. The survey instrument used a four-point scale to answer questions and the findings were analyzed by calculating a mean score for each. The means were presented in bar graph form and the scores of each sex compared.

The survey was given at the end of the semester and perhaps this colored their answers by exposure to the teacher. A variation could be to give the survey at the beginning of the school year in order to avoid affecting their answers. It would be interesting to compare surveys from the first day of school to those from the last and see how, if at all, they have changed. Also worth noting is that the method of compiling the results fails to show the extremes of responses. As the surveys were analyzed and recorded, it was clear to see that some females were very interested in the class, while some males were equally uninterested.

Conclusions

This study of sixth graders at Kennedy Middle School had results that were aligned with most gender related Technology Education research.

The most easily identified finding was that more boys are interested in Technology Education classes and technology than girls. In virtually every category, their mean score was higher, generally at least 0.5 on a scale of four, and frequently

more. As described in Chapter Two, this situation has been the focus of Technology Education research for the last ten years. Some measures have been implemented and recent statistics have shown an increase in female enrollment (WDPI, 2001), but it doesn't appear to be changing very fast or very soon. This does not come as a surprise for the causes are complex and not all known, and are interlinked with so many forces that there is no simple way to "solve the problem".

Despite all that, girls were found to like the hands-on aspects of Technology Education almost as much as boys do. This fits with Silverman and Pritchard (1996) who stated that girls are often initially ill at ease with tools, but catch on quickly. Anecdotal evidence has suggested that girls experience a more intense fear of power tools (or perhaps a more reasonable caution) than boys, and are more likely to forgo using one if offered another method. However, many girls have also overcome that fear by making themselves use the power tool and have built some confidence in the process.

Sixth graders are quite alike in that they predominately perceive technology as objects, such as cars and computers. Both genders generated very similar lists of items in almost identical amounts. This in itself is worth noting because it seems to demonstrate that adolescent males and females see technology very similarly, but see the role it plays in their lives very differently. This is also frustrating because it is the bane of technology education teachers that people see technology as primarily computers. One of the ideas behind modern Technology Education curriculum is that technology is a human trait that has been with us from the beginning. It is about improving our lives by applying ideas, and computers are only the latest manifestation. That idea, however, is conceptual and

sixth grade is only the very beginning of the mental transition from concrete to abstract. Teaching them that could be synergistic but it also could be just difficult.

The one area where girls exhibit more interest than boys is in using technology to connect them to other people to meet and maintain relationships, though boys have some interest in this as well. The researcher had not seen the "people connecting" aspect of technology addressed in a study until Paniagua (1999). What is interesting about this result is that it does echo much of what Gilligan (1982) discusses in *In A Different Voice*, that women highly prize their relationships with other people. If this is true than it should be explored as an avenue with which to peak the interest of young girls in technology. Communication is, after all, one the four basic areas of Technology Education (along with transportation, construction and manufacturing), so this could be a possible way to approach it.

The area of greatest male interest was in how technological systems work. Some girls have an interest in this, too. This is where Technology Education most resembles Industrial Arts. It is probably what most teachers enjoy teaching most and for good reason, because it is likely interesting to them and is the easiest part of the class to make hands-on. This is certainly the case at Kennedy Middle School. Unfortunately, this may be for Technology Education what a "founding father's" and "war story" version of history was for social studies. It was interesting for the teacher and enjoyable for some of the class, but it left another part of the class completely out of it. By choosing to teach something so narrowly it denies the opportunity for some students to connect. Social studies had to find new methods. It may be time for Technology Education to do the same. This does not mean mechanics should be abandoned. It is liked by many and is

undoubtedly important, but it should be only one part of a greater whole. It should be carefully changed, however, because it is often this quality that makes the shop classes a refuge for many students who have little success elsewhere in the school building.

Neither gender was very interested in the environmental or societal impacts of technology. This is regrettable because throughout their lives this may be where technology touches them the most. Major construction projects, and future transportation and communication systems will affect every student at some time. Politicians will need (and should have) an informed electorate to guide them when spending taxpayers' money. Clean air and water, adequate food production and waste disposal are big issues today that will only grow larger with time. The media will become even more pervasive, influencing their lives (and their children's) and requiring critical thinking skills. The need for a "big picture" view of technology is paramount. Either activities must be developed that will interest early adolescents in these aspects of it or it has to be taught in higher grades.

The different perceptions of technology by gender have important ramifications that go way beyond the classroom and encompass family life, greater society, and the interrelations of males and females. As our culture grows more and more technological, there is a significant part of the population left disenfranchised. It is no secret that women still earn less money and occupy far fewer positions of authority than men, and technology <u>is</u> power and money. How can this situation be rectified when an entire gender is denied a basic understanding of technology and its role in their lives?

The problem is two sided. We as a society, as parents, teachers, media, government, industry, etc. are failing to make girls interested in technology. Many

parents just don't see Technology Education as a class for their obviously college bound daughters. The media portrays women as happy consumers of technology, yet rarely knowledgeable about it. Ignorance is bliss. The Technology Education department of Kennedy Middle School is not doing all it can to attract and interest female students. Despite how we try, we over stress the masculine aspects; the mechanics, the power, the "how does it work," and often fail to meaningfully connect the technological system to girls lives. Industry should also work with schools to create programs that reach out to girls, showing how women are involved in technology.

The girls themselves, however, are equally sexist, often dismissing Technology Education as a "boys' class" or going so far as to say their "husband will take care of it". Not every girl enjoys English, math, or science but they tend to take it seriously because they know it is important for success in later life. That same understanding does not always exist with Technology Education. We must make young females understand that this is necessary for living in today's world.

Recommendations

Given the results of this study, Kennedy Middle School and perhaps Technology Education in general should:

1. Put more emphasis on hands-on activities, particularly involving the woodshop and tool skills. Students are coming to the class wanting to work with their hands and are not receiving as much "shop time" as they would like. What makes this worse is that it is an element of the class that girls particularly enjoy.
2. Add activities to the curriculum that emphasize how technological systems allow people to communicate. These activities should allow the students to get out of

their desks and interact with one another. Possible additions could be photography, video, a radio station simulation, or something as simple as the "telephone" game where students have to verbally pass a message several times and try to keep it intact.

3. Develop interesting and involving activities to teach the impact of technology on society and the environment. Students must be made aware that technology is a double-edged sword and what may make their life easier may not have the same effect for everyone or everything.
4. Find ways to help students understand technological concepts and learn not to view technology as only objects. Early adolescence is when thinking begins to move from concrete to abstract, and this provides an excellent opportunity to enhance that change.
5. Find ways to make parents aware of the importance of Technology Education. Technology departments should have a special open house and encourage parents to attend classes. A letter should be sent home explaining the class and how it ties to future education plans. Most parents are old enough to have experienced "Industrial Arts" and remember it as vocational education. They must be shown that it offers many more skills that are useful for the college bound student, such as problem solving and applied science and math.
6. Examine class request records to find out if girls are signing up for Technology Education but are being displaced by boys who put it at a slightly higher preference. According to this study, 26 percent of girls at Kennedy Middle

School said they were interested and they would enroll, but only a few end up in classes.

7. More females must be encouraged to go into teaching Technology Education as a professional career. The field is overwhelmingly male and this just furthers the idea that it is a discipline for men. At the very least, women from industry or technically related jobs should be invited to classes to give real life explanations of females and technology.
8. Design classes that emphasize certain skills. One class could be about basic tool skills and more vocationally minded, while another could apply math, science, and higher-level thinking to solve problems. Teachers must also find ways for students to satisfy the requirements of a class in a way that is meaningful for them. The unique needs of all students must be addressed.

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Perspectives of Technology Survey

What I think about technology

Please complete the following sentence.

When I read or hear the word technology I tend to think of. . .

What I would like in a Technology Education class

I would like to. . .

	Very interested	Interested	Somewhat interested	Not interested
1. learn enough about technology so I can make better choices in choosing high school technology classes	☐ vi	☐ i	☐ si	☐ ni
2. know more about how technology affects the people in my community	☐ vi	☐ i	☐ si	☐ ni
3. better understand how or why technology is important in my life	☐ vi	☐ i	☐ si	☐ ni
4. learn about different ways technology is used in today's world	☐ vi	☐ i	☐ si	☐ ni
5. be able to learn how to use a lot of different tools to build things	☐ vi	☐ i	☐ si	☐ ni
6. learn ways that technology can help people work together better	☐ vi	☐ i	☐ si	☐ ni
7. learn about different careers in technology	☐ vi	☐ i	☐ si	☐ ni
8. learn how technology affects people in the world	☐ vi	☐ i	☐ si	☐ ni
9. explore what technology might look like when I graduate high school	☐ vi	☐ i	☐ si	☐ ni
10. explore different ways to use computer technology	☐ vi	☐ i	☐ si	☐ ni
11. learn how the electronics of a computer work	☐ vi	☐ i	☐ si	☐ ni
12. be able to use computers to meet and stay in touch with other people	☐ vi	☐ i	☐ si	☐ ni
13. learn if or what kind of technological job may be right for me	☐ vi	☐ i	☐ si	☐ ni
14. learn how technology affects our environment	☐ vi	☐ i	☐ si	☐ ni
15. feel more comfortable using technology	☐ vi	☐ i	☐ si	☐ ni
16. create something with technology to solve a problem	☐ vi	☐ i	☐ si	☐ ni
17. learn how to work on or fix things that are mechanical	☐ vi	☐ i	☐ si	☐ ni
18. explore how technology makes it possible for people to visit others who live far away	☐ vi	☐ i	☐ si	☐ ni

What I think about the Technology Education class at our school

I think the Technology Education class(es) in our school is mostly about. . .

	Strongly Agree	Somewhat Agree	Somewhat Disagree	Strongly Disagree
1. learning how to make things and how things work	☐	☐	☐	☐
2. learning different ways to use technology	☐	☐	☐	☐
3. learning how and why technology is important in my life	☐	☐	☐	☐
4. learning how and why technology is important in society	☐	☐	☐	☐
5. helping me plan for high school or for a career in technology	☐	☐	☐	☐
6. learning how technology connects people together	☐	☐	☐	☐

I think the Technology Education class(es) at my school:

- ☐ Matches my interests and I would probably sign up for it
- ☐ Matches my interests but I would probably <u>not</u> sign up for it
- ☐ Doesn't match my interests but I would probably still sign up for it
- ☐ Doesn't match my interests and I would probably <u>not</u> sign up for it

General

Are you a boy or a girl?..... boy ☐ girl ☐

What grade are you in?..... 6th ☐ 7th ☐ 8th ☐

Have you already had a class in Tech Ed this year..... yes ☐ no ☐

Appendix B

The following instructions were read to every class:

"I am completing my second college degree. In order for me to do this I must complete a project. My project is to study the perspective of sixth grade students towards technology and technology education. What is a perspective?" (In every class, at least one student volunteered "a point of view"). "Yes, it is a point of view. This is your chance to tell me what you think about this class. But I am not only interested in what you think about this class but also what you think about technology in general. We have talked about that a lot in this class, so I think you will have an opinion. Be sure to complete all four parts. Pay extra attention to part one, as a lot of students seem to miss it. Please don't do the last two questions. If you do not understand a question, I can clarify it for you but I cannot give you an answer. Do not put your name on it. Does anyone have any questions?"

Appendix C

Project Title: Perceptions of Technology and Technology Education by Sixth Grade Students

John Parrish, a teacher at the middle school, mastering in technology education through the University of Wisconsin-Stout is conducting a research project with sixth grade students and their perceptions of technology and technology education. I would appreciate your son's/daughter's participation in this study. With your permission, they will be asked to complete a questionnaire. It will be handed out on April , 2001 in the technology education department at Kennedy Middle School. Students will not be writing their names on the questionnaire.

It is not anticipated that this study will present any medical risk or social risk to your child. The information gathered will be kept strictly confidential and any reports of the findings of this research will not contain your child's name or any other identifying information.

Your child's participation is completely voluntary. You may choose not to have your son/daughter participate without any adverse consequences to him/her.

Questions or concerns about participation in the research or subsequent complaints should be addressed first to the researcher John Parrish (262-502-7430 KMS) or research advisor Dr. Ed Biggerstaff (715-232-2410 UW-Stout) and second to Dr. Ted Knous, Chair of UW-Stout Institutional Review Board for the Protection of Human Subjects in Research, 11 HH, UW-Stout, Menomonie, WI 54751, phone 715-232-1126.

Consent Form

I understand that my child's participation in this study is strictly voluntary and he/she may discontinue participation at any time without prejudice.

I understand that the purpose of this study is to investigate the perceptions of technology and technology education by sixth grade students. A copy of the questionnaire will be located in the Blue office of Kennedy Middle School for you to view.

I further understand that any information about my son/daughter that is collected during this study will be held in the strictest confidence and will not be a part of his/her permanent records.

I attest that I have read and understood the above description, and that all questions about the study have been answered to my satisfaction. I hereby give my informed consent to have my child participate in this study.

Parent's signature_____Date_____

Child's signature_____

Appendix D

Male Total Responses: 94
Female Total Responses: 101

Object	Male	Female
1. Computers	31	28
2. Electronics	10	8
3. Cars	5	6
4. Machines	6	5
5. Television	4	3
6. Compact Disks	2	3
7. Telephone	2	2
8. Trains	2	1
9. Internet	2	1
10. Planes	1	1
11. Movies	0	3
12. Robots	2	0
13. Appliances	0	2

Single Responses by Males:

14. Fork
15. Books
16. Games
17. Tools

Single Responses By Females:

18. Something with a motor in it.
19. Something that moves under its own power
20. Ship
21. Trash Can
22. Roller Coaster

Knowledge	Male	Female
1. How Things Work	2	4
2. Inventions	2	1
3. Knowledge	0	4

Single Responses by Males:
- 4. School
- 5. Science
- 6. Learning

Process	Male	Female
1. Transportation	2	4
2. Building Things	3	1
3. Electricity	1	1
4. Improving Lives	4	0
4. Power	0	2
5. Communication	0	2

Single Responses by Males:
- 6. Everything Made
- 7. Investing

Single Responses by Females:
- 8. Problem Solving
- 9. Wood Shop
- 10. Mechanics

Future	Male	Female
1. The Future	3	4

Other	Male	Female
1. Boring	1	6

Single Response by Female:

2. How I used to like it.